IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

D. Remarks

1. Rejections Under 35 U.S.C. §112, Second Paragraph.

The rejection of claims 1, 12 and 17 will first be addressed.

Claims 1, 12 and 17 have been amended to address this ground for rejection. The claims now recite a "good reticle pattern" as opposed to a "*known* good reticle pattern". Understanding of "good" reticle patterns is well understood in the art and supported by the Specification:

> [T]he pattern contained in a reticle is good (i.e., ultimately produces a desired pattern in an underlying layer)...[1]

The rejection of claim 9 will now be addressed.

Claim 9 has been amended to recite "in the range of about..." as opposed to "in the *general* range of about...".

2. Rejection of Claims 1-20 Under 35 U.S.C. §103(a), based on *Chen* (U.S. Patent No. 6,303,459).

First, the grounds for rejection will be clarified. While the Office Action indicates claims 1-20 are rejected based only on *Chen*, it appears the intended ground for rejection was for claims 1-4 and 6-20 based on *Chen* in view of "Brown" (no citation provided), which is believed to be previously cited *Brown et al.* (U.S. Patent No. 6,420,766). Accordingly, this response addresses *Chen* in view of *Brown et al.* Further, this Section will not address claim 5, as no reasons for rejecting claim 5 were presented based on the two cited references.

The rejection of claims 1-11 will first be addressed.

The invention of amended claim 1 is directed to a method of verifying a reticle. The method includes providing a substrate, depositing a non-resist layer over the substrate, forming a layer of resist over the non-resist layer, forming a reticle pattern in the layer of resist, transferring the reticle pattern to the non-resist layer, forming a conformal layer over the non-resist layer,

[1] The Specification, Page 2, Lines 3-4.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

wherein the conformal layer includes a transferred reticle pattern, at least a portion of which extends through the non-resist layer. The method also includes inspecting the transferred reticle pattern for defects by comparing the transferred reticle pattern to a good reticle pattern.

As is well established, a prima facie case of obviousness must meet three basic criteria. First, there must be some suggestion or motivation to modify a reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference(s) must teach or suggest all claim limitations.[2]

The rejection is not believed to show or suggest numerous limitations of Applicants' claim 1. Each limitation will be discussed in separate sections below.

a. "forming a layer of resist over the non-resist layer"

To show this limitation, the rejection relies on the following reasoning:

> Chen describes... forming a layer of resist over the non resist layer; (Chen figure 2 # 12, col. 6, line 17)...[3]

Applicants respectfully disagree. Item 12 of *Chen* is never described as being a layer of resist, but rather as an alignment marker mask.

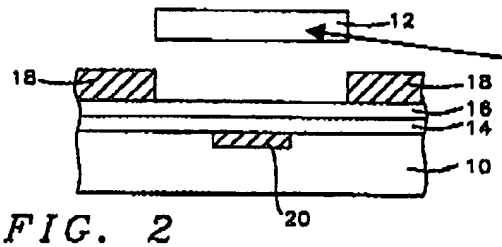


FIG. 2

"Alignment marker mask 12 is used to intercept the deposition of aluminum..." (*Chen*, Col. 6, Lines 17-18)
[Never described as being resist]

Accordingly, this limitation is not shown by the reference. Further, because the alignment marker mask appears suspended above any other layer, *Chen* is not believed to be suggestive of a resist layer, either.

---

[2] MPEP §2143.
[3] Office Action, dated 03/26/04, Page 3, third line from bottom to Page 2, Line 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

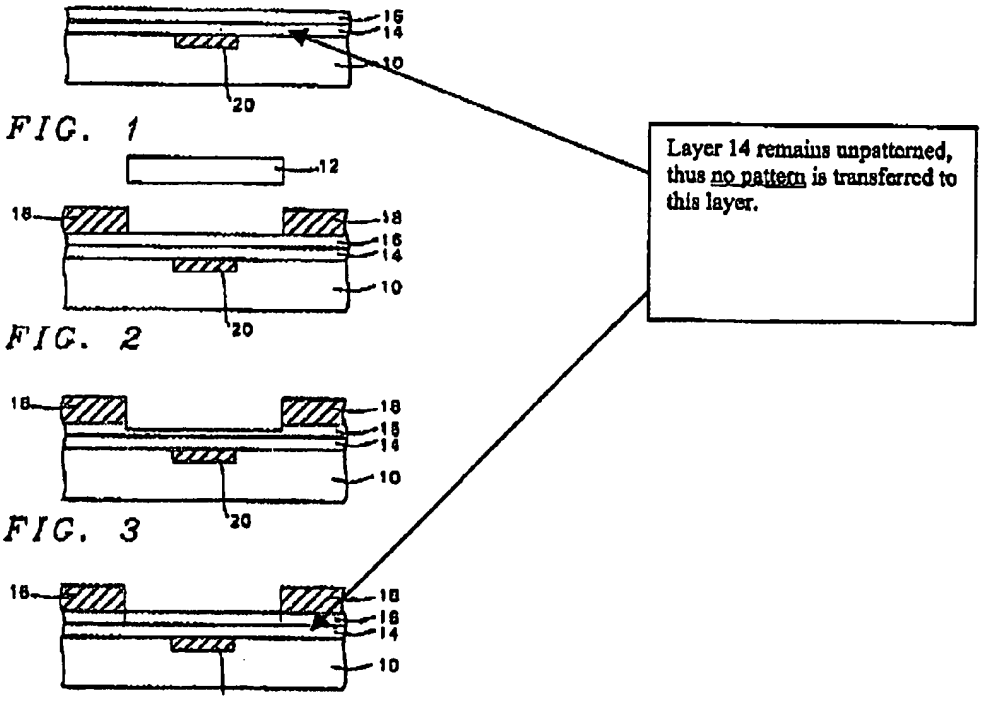
Accordingly, the cited reference does not show this limitation, as argued by the rejection.

b. "transferring the reticle pattern to the non-resist layer"

To show this limitation, the rejection relies on the following reasoning:

> Chen describes... depositing, a non resist layer over the uniform surface of the substrate (Chen figure 1 # 14)... transferring the reticle pattern to the non resist layer, (Chen col. 6 lines 2-23)...[4]

Clarification for this ground of rejection is respectfully requested. The layer argued to correspond to Applicants' non-resist layer (passivation layer 14 if *Chen*) remains entirely unpatterned. Thus, a pattern is never transferred to this layer, as recited in claim 1.



[4] Office Action, dated 03/26/04, Page 3, third line from bottom to Page 2, Line 4.

Accordingly, assuming that the rejection is arguing that the passivation layer 14 of *Chen* corresponds to Applicants' "non-resist" layer, the reference cannot show this claim limitation, as argued by the rejection.

c. "comparing the transferred reticle pattern to a good reticle pattern"

Neither *Chen* nor *Brown et al.* shows or suggests this claim limitation, as both references are unrelated to reticle inspection.

Chen is directed to forming an aluminum pad for a semiconductor device that can serve as an alignment pad:

> The invention teaches a method of forming an aluminum pad... The process... is aimed at creating alignment pads but can possibly be extended to bond pads or any other large surface area on the surface of a semiconductor substrate.[5]

An alignment pad according to *Chen* is utilized to align reticles, and is unrelated to the inspection of reticle patterns:

> The wafer stepper tool uses the alignment mark on the wafer as a point of reference. With this reference point, the position of the reticle is adjusted over the wafer such that the reticle is precisely aligned with the previous layer on the wafer...[6]

Thus, because *Chen* is unrelated to reticle pattern inspection, the reference cannot show, and is not believed to be suggestive of Applicants' inspection step.

Brown et al. is not believed to be any more suggestive of Applicant's inspection step. *Brown et al.* describe a transistor having a raised source and drain and a fabrication method for such a transistor. *Brown et al.* illustrates the printing of reticle line patterns with various resist

[5] *Chen*, Col. 4, Lines 21-31.
[6] *Chen*, Col. 2, Lines 56-61.

types[7], but never shows or suggests the inspection of reticle pattern.

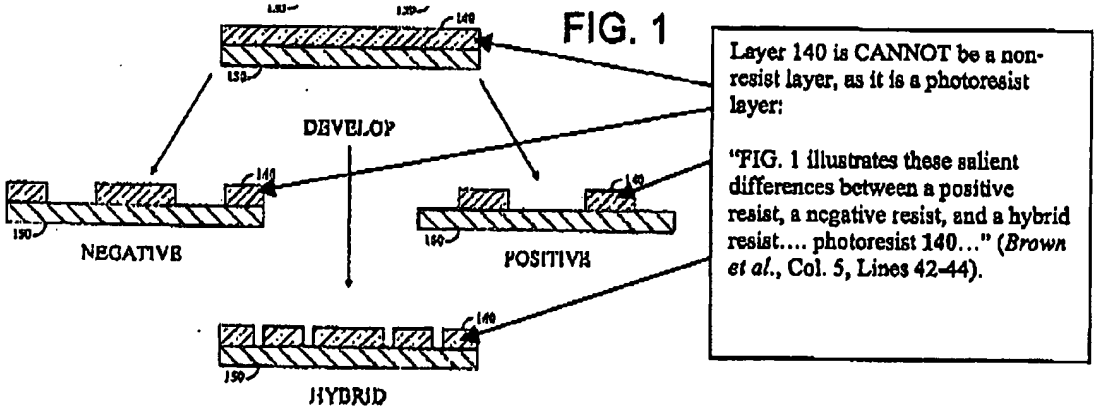
Because reticle alignment is not related to inspection of a reticle pattern by comparing to a good reticle pattern, this claim limitation is not shown by the references, either.

d. "a transferred reticle pattern, at least a portion of which extends through the non-resist layer"

The rejection admits that *Chen* does not show this limitation, and relies on *Brown et al.* as follows:

> Brown in figure 1 figure marked "hybrid, etc." shows at least a portion of the transferred reticle pattern extending through the nonresist deposited layer...

Clarification for this ground of rejection is respectfully requested. Applicants' claim 1 recites at least of a portion of a transferred reticle extending through a non-resist layer. The figure of *Brown et al.* relied upon by the rejection is showing pattern through resist layers:



It is not understood how the patterns through resist layers shows or suggest patterns through non-resist layers. In fact, the above portion of *Brown et al.* clearly teaches away from Applicants'

[7] See *Brown et al.*, FIGS. 2-3 and 5, for example.

claim 1 limitations, as the non-resist layer (150) remains unpatterned.

For all of these reasons, the cited combination of reference does not show or suggest all the limitations of claim 1. Accordingly, a prima facie case of obviousness has not been established, and this ground for rejection is traversed.

Various claims depending from claim 1 are believed to be separately patentable over the cited references.

Claim 4 recites that the conformal layer comprises a plurality of stacked layers. The plurality of stacked layers comprises a layer of titanium nitride formed over a layer of titanium. Such an arrangement is not shown or suggested by the reference as relied upon in the rejection. To show the limitations of claim 4, the rejection relies on the teachings of *Chen*:

> With respect to claim 4... the conformal layer further comprises a plurality of stacked layers comprising a layer of titanium nitride formed over a layer of titanium. (Chen col. 6 lines 5-6 and col. 5 line 66 to col. 6. line 4).[8]

The portion of the reference relied upon to show Applicants' claim 4 limitations is set forth below:

> A typical diffusion barrier layer 16 may contain silicon nitride, phosphosilicate glass (PSG), silicon oxynitride, aluminum, aluminum oxide (AlxOy), tantalum, titanium nitride, nionbium, or molybdenum. A barrier layer is typically deposited using rf. sputtering, to a thickness between about 500 to 1000 Angstrom.
>
> The preferred barrier layer 16 of the invention contains tantalum nitride (TaN) and is deposited over the surface of the passivation layer 14 to a thickness of about 600 Angstrom.[9]

The reference relied upon by the rejection does not show the limitations of claim 4. First,

[8] Office Action, dated 03/26/04, Page 3, third line from bottom to Page 5, Lines 7-9.
[9] *Chen*, Col. 5, Line 66 to Col. 6, Line 8.

the above portion never shows or suggests any stacked layer arrangement, only a single layer arrangement. This is emphasized by the conjunction "or" at the end of the list of possible materials (i.e., "silicon nitride... nionbium [sic], *or* molybdenum."). Second, the list of materials does not include titanium as recited in claim 4, only titanium nitride.

Accordingly, the rejection does not show or suggested all limitations of claim 4, and hence a prima facie case of obviousness has not been established for this claim.

Claim 8 recites that the non-resist layer comprises undoped silicon dioxide formed over a layer of phosphosilicate glass (PSG). Such an arrangement is not shown in the cited reference.

As noted above, as best understood by the Applicants, the rejection equates a passivation layer 14 of *Chen* with Applicants' non-resist layer. However, PSG is never shown or suggested to be a material for passivation layer 14. *Chen* describes PSG as a material for diffusion barrier layer 16, which is argued to correspond to Applicants' conformal layer not Applicants' non-resist layer:

> A typical ***diffusion barrier layer 16*** may contain silicon nitride, phosphosilicate glass (PSG)...[10]

Accordingly, the rejection does not show or suggest all limitations of claim 8, and hence a prima facie case of obviousness has not been established for this claim.

The rejection of claims 12-16 will now be addressed.

The invention of amended claim 12 is directed to a method of verifying a reticle. The method comprises the steps of: providing a substrate having a uniform surface; depositing a non-resist layer over the uniform surface of the substrate; forming a layer of resist over the non-resist layer; forming a reticle pattern in the layer of resist; transferring the reticle pattern to the non-resist layer; forming a conductive conformal layer with a thickness of at least 100Å over the transferred reticle pattern in the non-resist layer, at least a portion of a transferred reticle pattern extending through the non-resist layer; and inspecting the reticle pattern in the deposited layer by comparing the transferred reticle pattern to a good reticle pattern.

[10] *Chen*, Col. 5, Lines 66-67.

To address this ground for rejection, Applicants' incorporate by reference herein the comments set forth above in Section 2 as detailed below.

First, Applicants incorporate by reference herein the comments of section 2a. to show that the claim 12 limitation "forming a layer of resist over the non-resist layer" is not shown or suggested by the cited combination, as argued by the rejection.

Second, Applicants incorporate by reference herein the comments of section 2b to show that the claim 12 limitation of "transferring the reticle pattern to the non-resist layer" is not shown or suggested by the cited combination, as argued by the rejection.

Third, Applicants incorporate by reference herein the comments of section 2c to show that the claim 12 limitation of "comparing the transferred reticle pattern to a good reticle pattern" is not shown or suggested by the cited combination, as argued by the rejection.

Fourth, Applicants incorporate by reference herein the comments of section 2d to show that the claim 12 limitation of "at least a portion of a transferred reticle pattern extending through the non-resist layer" is not shown or suggested by the cited combination, as argued by the rejection.

Claim 13, which depends from claim 12, is believed to be separately patentable over the cited combination of references. Claim 13 recites that the step of inspecting the transferred reticle pattern is by means of automatic pattern inspection equipment. Claim 13 depends from claim 12, which recites that this step compares a transferred reticle pattern to a good reticle pattern. To show this limitation, the rejection relies on the following reasoning:

> With respect to claim 13... inspecting the transferred pattern comprises with automatic pattern inspecting equipment (Chen col. 2 lines 58-60)."[1]

However, the portion of *Chen* relied upon by the rejection is unrelated to inspection by comparing reticles patterns, but aimed at alignment operations for a wafer stepper:

> The wafer stepper tool uses the alignment mark on the wafer as a point of reference. With this reference point, the position of the reticle is adjusted over the

[1] Office Action, dated 03/26/04, Page 6, Lines 9-11.

wafer such that the reticle is precisely aligned with the previous layer on the wafer.[12]

Thus, because *Chen* shows automatic pattern alignment and is silent as to comparing patterns, the reference is not believed to show or suggest the limitations of claim 13.

The rejection of claims 17-20 will now be addressed.

The invention of amended claim 17 is directed to a method that includes providing a substrate having a uniform surface; depositing a non-resist layer over the uniform surface of the substrate; forming a layer of resist over the non-resist layer; forming a reticle pattern in the layer of resist; transferring the reticle pattern to the non-resist layer, at least a portion of the transferred reticle pattern extending through the non-resist layer; forming a conformal layer over the non-resist layer to thereby increase contrast between patterned and non-patterned portions of the non-resist layer; and inspecting the reticle patterned layer by comparing the transferred reticle pattern to a good reticle pattern.

To address this ground for rejection, Applicants incorporate by reference herein the comments set forth above in Section 2 as detailed below.

First, Applicants incorporate by reference herein the comments of section 2a. to show that the claim 17 limitation "forming a layer of resist over the non-resist layer" is not shown or suggested by the cited combination, as argued by the rejection.

Second, Applicants incorporate by reference herein the comments of section 2b to show that the claim 17 limitation of "transferring the reticle pattern to the non-resist layer" is not shown or suggested by the cited combination, as argued by the rejection.

Third, Applicants incorporate by reference herein the comments of section 2c to show that the claim 17 limitation of "comparing the transferred reticle pattern to a good reticle pattern" is not shown or suggested by the cited combination, as argued by the rejection.

Fourth, Applicants incorporate by reference herein the comments of section 2d to show that the claim 17 limitation of "at least a portion of a transferred reticle pattern extending through the non-resist layer" is not shown or suggested by the cited combination, as argued by the rejection.

[12] *Chen*, Col. 2, Lines 57-61.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

3. Rejection of Claim 5 Under 35 U.S.C. §103(a), based on *Chen* (U.S. Patent No. 6,303,459) in view of "Brown" (assumed to be *Brown et al.* U.S. Patent No. 6,420,766) further in view of *Leedy* (U.S. Patent No. 5,985,693).

To the extent that this ground for rejection relies on *Chen* and *Brown et al.*, the comments set forth above for claim 1 are incorporated by reference herein. That is, the cited combination of reference does not show numerous limitations of base claim 1.

The rejection admits that neither *Chen* nor *Brown et al.* shows or suggests the limitations of claim 5. To arrive at Applicants claim 5 invention, the rejection relies on the following reasoning:

> Leedy describes in col. 36 lines 34 to 40... making images in the size of 25 um (L) and in col. 35 lines 9-10 describes the conformal layer of 2000 angstroms (i.e., less than ½ L thick)...[13]

This reasoning cannot establish a prima facie case of obviousness for claim 5. Applicants note that claim 5 is directed to a transferred pattern in a non-resist layer having a minimum size L. The above-cited portion of *Leedy* is not related to a transferred pattern or any minimum size:

> An example would be a ***shutter cell with an area of 25 μm*** by 25 μm and a REA setting of 0.1 μm in diameter. In order for the REA to expose an area the size of the shutter cell, a scanning motion of 25 μm by 0.1 μm would be made 250 times in the X-axis while translating 0.1 μm in the Y-axis after each scan. The size setting of the REA is typically fixed for a given scan of the substrate...[14]

The above portion shows that the rejections arguments are factually incorrect. The feature having an area of 25 μm x 25 μm is not a pattern transferred to a non-resist layer. It is a shutter cell. A shutter cell is a portion of lithography tool, not some layer formed on a substrate. The shutter cell is activated to project a pattern onto a substrate:

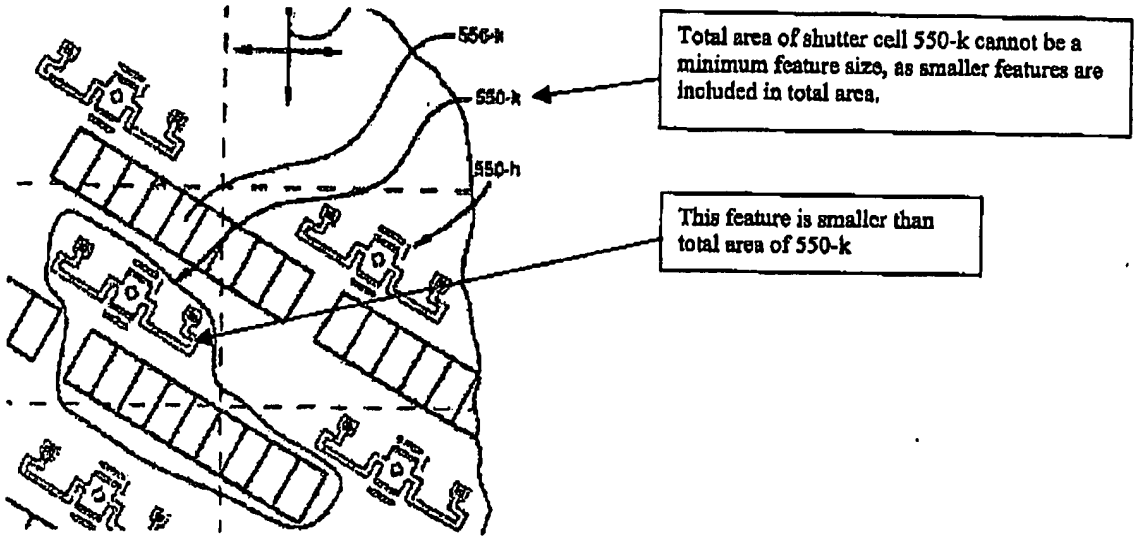
---

[13] Office Action, dated 03/26/04, Page 8, Lines 3-5.
[14] *Leedy*, Col. 36, Lines 34-40.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

FIGS. 29g through 29k show portions of a direct write lithography tool which uses repeated micro-machined mechanical electro-static ***shutter cell 550-k*** for the patterning of photonic or particle exposure source.[15]

Further, it is obvious from the figure that 25 μm cannot be a minimum feature size, as the structure clearly includes smaller features than the total area:



Thus, the rejection's reliance on *Leedy* cannot not show a transferred pattern in a non-resist layer having a minimum size L, as recited in claim 5.

For all of these reasons, a prima facie case of obviousness is not believed to have been established for this claim, and this ground for rejection is traversed.

[15] *Leedy*, Col. 36, Lines 49-52.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Claims 1, 9, 11-12, and 17 have been amended, not in response to the cited art, but to address rejections of form and to correct typographical errors.

The present claims 1-20 are believed to be in allowable form. It is respectfully requested that the application be forwarded for allowance and issue.

Respectfully Submitted,

6/18/04

Bradley T. Sako
Attorney
Reg. No. 37,923

/Bradley T. Sako
WALKER & SAKO, LLP
300 South First Street
Suite 235
San Jose, CA 95113
Tel. 1-408-289-5315